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CROSS-POLLINATION OF OLIVE FLOWERS.

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Mr. President, Ladies and Gentlemen: "To know that which lies before us in daily life is the prime wisdom." Although Knight, Darwin and others long since pointed out the fact that the cross-fertilization of plants should take place, its importance to fruit growers is not realized by them, and it is only very recently that practical attention has been given to the subject so far as fruit culture is concerned.

In 1891-1892, Mr. M. B. Waite, under the direction of the United States Department of Agriculture, made experiments in pollinating pear and apple flowers, by which it was found that many well known varieties of pears and apples are partially or completely self-sterile, that is, their pollen is impotent to their own flowers, but potent and able to fecundate the flowers of other varieties. For instance, his report shows that the Bartlett pear pollen can only in a small degree fecundate its own flowers, while the same pollen completely fecundates the flowers of the Anjou pear. Not only is the crop more bountiful by cross-pollination but the fruit in some cases is increased in size, thus indicating that with certain varieties of pears and apples it is necessary to plant other varieties with them in the same orchard to get the greatest yield of fruit.

It is well known to almond growers on this coast that if a good crop of almonds is to be had, different varieties must be planted in the same orchard.

To ascertain if this is also the case with olives, I have been on the lookout the present season for object lessons, some of which I will now mention: In a Mission orchard a few miles from this place the crop was light, but there are several bearing trees of the Picholine variety, and near those the Mission trees bore heavily. A number of Nevadillo trees near this city, planted two years ago last winter, are bearing lightly, but one of them is bearing heavily and that one is near a bearing Mission tree. The heaviest bearing trees noticed this season are those standing near other varieties in bearing.

Supplemental to the above I give briefly the method and the results of some experiments in self-pollination and in cross-pollination of olive flowers by hand made last spring, which has a direct bearing upon the question whether it is advantageous to plant different varieties of olives in proximity.

NAMES OF VARIETIES.	*Number of flowers cross-pollinated by hand.*	*Number of flowers covered with paper sacks.*	*Number of uncovered flowers counted.*	*No. of olives from flowers x pollinated by hand.*	*Number of olives from flowers under cover.*	*Number of olives from flowers exposed.*
Nevadillo x with Mission	22	22	22	2	0	0
Manzanillo x with Mission	45	45	45	0	0	0
Mission x with Pendulina	46	46	46	1	0	0
Columella x with Rubra	22	22	22	11	2	0
Rubra x with Columella	71	71	71	9	0	11
Pendulina x with Columella	39	39	39	3	0	5
Atro-Vialacea x with Nevadillo	41	41	41	2	6	6
Morinello x with Nevadillo	39	39	39	4	3	3
Ascolana x with Rubra	22	22	22	0	0	0
Cayon x with Rubra	45	45	45	1	2	8
Atro-Rubens x with Rubra	20	20	20	1	0	0
Totals	412	412	412	34	13	33

Bees direct from the hive with no pollen adhering to them were put in the sacks covering the Columella, Rubra, Atro-Vialacea and Cayon flowers.

It was found by Mr. Waite in his experiments with pear and apple flowers that covering them with sacks was no detriment to self-pollination.

Owing to the structure of olive flowers it is almost impossible for the pollen to be discharged without coming in contact with the parts intended for it. Upon examination the flowers under the sacks not cross-pollinated by hand were found to be covered with pollen. So it is fair to assume that those flowers were completely self-pollinated. It will be seen from the above table that in the aggregate there were more than twice the number of olives from those flowers cross-pollinated by hand, also from those exposed, than from those self-pollinated although in case of Atro-Vialacea and Morinello there are as many olives from the self-pollinated flowers as from those exposed but, this may be accidental or it may be those varieties do not need to be crossed. The covering of a certain number of flowers and comparing the number of olives from them with the result from the some number of flowers on the same tree exposed or cross-pollinated by hand, simply indicates whether the variety is self-fertile or not; to determine what varieties are fertile to each other requires either cross-pollination by hand or noting the results in orchards, the conditions are not favorable to the latter method to any great extent.

The work of cross-pollination with this end in view was commenced on the 7th of May last when the first flowers opened; each variety continued in bloom about three weeks and it was necessary to treat the flowers under each sack from day to day as they came out; one of the points of a thin bladed pair of scissors was used to remove the pollen or emasculate the flowers, each flower was examined with a lens after being emasculated and if the least pollen was found upon it the specimen was rejected. The unusual dropping this season of a large percentage of olives before full grown is a factor which may have effected the result. The trees on which the experiments were made are standing near together in my variety orchard excepting the Nevadillo and Manzanillo which are not far from other varieties in bearing; the weather was pleasant during the entire period and bees were plentiful on the flowers so that everything was favorable to cross-pollination of the exposed flowers by insects.

The table shows that there were 412 flowers cross-pollinated by hand, the same number covered and the same number exposed to insect visits taken into account; the result noted August 7th was 34 olives from the flowers cross-pollinated by hand, 13 from those covered and 33 from those exposed to insect visits. It will be seen that there are not as many olives from the flowers of Rubra, Pendulinat, Atro-Vialacea and Cayon cross-pollinated by hand as there are of those exposed, but the work on these varieties may have been imperfectly done or in emasculating the flowers some of them may have been injured, which would effect the result. The experiments indicate that the pollen used was potent to the varieties to which it was applied excepting perhaps the Cayon, though there may be other causes which effected the result in case of that variety.

For the purpose of cross-pollination in an orchard by insects it is essential that the varieties bloom at the same time which is practically the case with all the varieties considered in the work.

From the experiments of Mr. Waite with the pear and apple, it is gathered that even with those varieties which are capable of self-fecundation the pollen of another variety is prepotent, and that when climatic and other conditions are unfavorable to the fruitage of varieties in general the advantage of cross-pollination is particularly noticeable.

All the data bearing upon these experiments have been given so that the conditions and the results may be studied, but it will require further investigation to determine the question and I hope to continue the work next season on a larger number of varieties.

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